MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2018/2019

PTM0145 – TRIGONOMETRY

(Foundation in Information Technology / Life Sciences)

1 June 2019
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **TWO** pages excluding the cover page and the Appendix.

2. Answer **ALL FIVE** questions. All questions carry equal marks and the distribution of the marks for each question is given.

3. Please write all your answers in the Answer Booklet provided.

4. All necessary working steps **MUST** be shown.

Question 1 [10 marks]

a. Given that $z=3\left(\cos\left(\frac{4\pi}{3}\right)+i\sin\left(\frac{4\pi}{3}\right)\right)$ and $w=6\left(\cos\left(\frac{\pi}{6}\right)+i\sin\left(\frac{\pi}{6}\right)\right)$

Compute zw and $\frac{z}{w}$, and leave your answer in $a+bi$ form. (4 marks)

b. Express $z=-\frac{1}{2}-\frac{\sqrt{3}}{2}i$ in polar form and calculate z^{10}. Leave your answer in polar form. (6 marks)

Question 2 [10 marks]

a. Write an equation for the parabola with focus at $(8,0)$ and the directrix given by $x=2$. (3 marks)

b. An ellipse is given by the equation $4x^2+3y^2-16x+18y=-31$. Find

i. the center of the ellipse
ii. its vertices
iii. its foci.

Hence, sketch the ellipse. (7 marks)

Question 3 [10 marks]

a. If $\sin\alpha=-\frac{3}{5}$, $\frac{3\pi}{2}\le\alpha\le 2\pi$ and $\cos\beta=-\frac{\sqrt{21}}{5}$, $\pi<\beta<\frac{3\pi}{2}$, find the exact value of the following:

i. $\sin(\alpha-\beta)$ (3 marks)

ii. $\tan 2\alpha$ (2 marks)

b. Solve the following equation for $0\le x\le 2\pi$:

$\cos x-2\sin^2 x+1=0$ (5 marks)

Question 4 [10 marks]

a. Establish the identity.

$$1-\frac{\cos^2 x}{1+\sin x}=\sin x$$ (3 marks)

b. Solve the triangle where $a = 51$, $b = 41.4$ and $c = 38.4$. Then find the area of ABC. (7 marks)

Continued...

Question 5 [10 marks]

Use Cramer's rule to solve the linear system.

$$9x+4y-z=48$$
$$x-8y+3z=-52$$
$$9x+y+z=33$$

(10 marks)

End of Paper

APPENDIX

Trigonometry Identities

$$\cos^2 A + \sin^2 A = 1 \qquad \sec^2 A = 1 + \tan^2 A \qquad \csc^2 A = 1 + \cot^2 A$$

$$\cos(A+B) = \cos A\cos B - \sin A\sin B$$
$$\cos(A-B) = \cos A\cos B + \sin A\sin B$$
$$\sin(A+B) = \sin A\cos B + \cos A\sin B$$
$$\sin(A-B) = \sin A\cos B - \cos A\sin B$$
$$\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A\tan B}$$
$$\tan(A-B) = \frac{\tan A - \tan B}{1 + \tan A\tan B}$$

$$\cos 2A = \cos^2 A - \sin^2 A$$
$$= 2\cos^2 A - 1 = 1 - 2\sin^2 A$$
$$\sin 2A = 2\sin A\cos A$$
$$\tan 2A = \frac{2\tan A}{1 - \tan^2 A}$$

$$\sin A\cos B = \frac{1}{2}[\sin(A+B) + \sin(A-B)]$$
$$\cos A\cos B = \frac{1}{2}[\cos(A+B) + \cos(A-B)]$$
$$\sin A\sin B = \frac{1}{2}[\cos(A-B) - \cos(A+B)]$$

$$\sin A + \sin B = 2\sin\frac{A+B}{2}\cos\frac{A-B}{2} \qquad \sin A - \sin B = 2\cos\frac{A+B}{2}\sin\frac{A-B}{2}$$

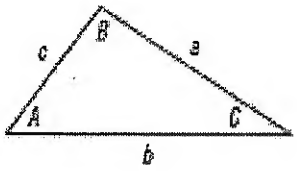
$$\cos A + \cos B = 2\cos\frac{A+B}{2}\cos\frac{A-B}{2} \qquad \cos A - \cos B = -2\sin\frac{A+B}{2}\sin\frac{A-B}{2}$$

$$\sin^2\frac{A}{2} = \frac{1-\cos A}{2} \qquad \cos^2\frac{A}{2} = \frac{1+\cos A}{2} \qquad \tan^2\frac{A}{2} = \frac{1-\cos A}{1+\cos A}$$

$$\sin\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{2}} \qquad \cos\frac{A}{2} = \pm\sqrt{\frac{1+\cos A}{2}} \qquad \tan\frac{A}{2} = \pm\sqrt{\frac{1-\cos A}{1+\cos A}}$$

$$\tan\frac{A}{2} = \frac{1-\cos A}{\sin A} = \frac{\sin A}{1+\cos A}$$

Triangles



Law of Sines:

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

Law of Cosines:

$$c^2 = a^2 + b^2 - 2ab\cos C$$
$$b^2 = a^2 + c^2 - 2ac\cos B$$
$$a^2 = b^2 + c^2 - 2bc\cos A$$

Area of a Triangle: $A = \frac{1}{2}ab\sin C = \frac{1}{2}bc\sin A = \frac{1}{2}ac\sin B$

$$A = \sqrt{s(s-a)(s-b)(s-c)} \quad \text{where} \quad s = \frac{1}{2}(a+b+c)$$

Polar Coordinates

$$x = r\cos\theta$$
$$y = r\sin\theta$$
$$r = \sqrt{x^2 + y^2}$$
$$\tan\theta = \frac{y}{x}$$